George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

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ORGANIZATIONAL INSTRUCTION

Professional Development Roadmap (PDRM) for Quality Engineers

OPR(s)	**OPR DESIGNEE**
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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline	Draft 1	03/03/04	New document.
Revision	A	10/15/04	Revised to bring document in compliance with the HQ Rules Review Action (CAITS: 04-DA01-0387). Changes were also made to reflect S&MA organizational name changes (i.e., QS to QD) and correct errors. Added "Guidelines" to the title. Added OJT requirements to Appendix A.
	B	12/6/04	Administrative change – removed Apprentice as a qualification
	C	3/9/05	Administrative change – changed PDR to PDRM throughout document

Professional Development Roadmap for S&MA Quality Engineers

1. PURPOSE, SCOPE, APPLICABILITY

1.1. Purpose – The purpose of this organizational instruction (OI) is to establish a voluntary training and development roadmap for quality engineers within the Marshall Space Flight Center (MSFC) Safety and Mission Assurance (S&MA) Directorate. This OI identifies the minimum level of training, knowledge and skills that MSFC S&MA quality engineers shall acquire in developing their assurance/engineering discipline expertise to progress in this voluntary program.

1.2. Scope – This OI is meant to serve as a development roadmap for Quality Engineers who support MSFC Programs and Projects. It provides a comprehensive list of training, knowledge requirements and on-the-job (OJT) experience needed by MSFC S&MA quality engineers to effectively execute their duties.

This roadmap establishes an entry level (Apprentice) and three qualification levels (Novice, Journeyman and Expert), and provides a process for progressive qualification at each achievement level.

This roadmap shall be used in conjunction with Individual Development Plans (IDP) to encourage quality engineering specialists to pursue development activities most appropriate to their specialty. The intent is to use the roadmap to guide the development of IDPs for S&MA quality engineers.

1.3. Applicability – This OI applies to all MSFC S&MA personnel who seek to provide MSFC S&MA quality engineering services, both in-house and off site, and who choose to participate. Mission support contractor personnel are also encouraged to participate in this voluntary program.

Personnel must satisfy the prerequisites specified in Appendix A of this OI before participating in this roadmap process.

2. DOCUMENTS

2.1. Applicable Documents

2.1.1 MPR 3410.1 Training
2.1.2 Individual Development Plan Instruction
2.1.3 MWI 3410.1 Personnel Qualification Program

2.2 Reference Documents

2.2.1 Organizational Instruction: QD-A-005, Professional Development Roadmap (PDRM) for System Safety Engineers, Safety and Mission Assurance, Marshall Space Flight Center.

2.2.2 Organizational Instruction: QD-A-003 Professional Development Roadmap (PDRM) for Reliability and Maintainability Engineers, Safety and Mission Assurance, Marshall Space Flight Center.

3. DEFINITIONS AND ACRONYMS

3.1 The Professional Development Roadmap (PDRM) identifies and documents the minimum training, knowledge requirements and on-the-job (OJT) experience needed by MSFC S&MA personnel at four levels of their discipline expertise development.

3.2 Individual Development Plan (IDP) – Is a document developed jointly by the employee and supervisor to plan the employee's training and development needs as well as to identify possible training solutions. The plan shall focus on immediate and short-term goals that are in line with the longer-term goals of both the employee and the organization.

3.3 Qualification – The act of verifying and documenting that personnel have completed required training and have demonstrated specified proficiency.

3.4 Qualification levels – Are defined as:

- Novice: The lowest recognizable level (Appendix A)
- Journeyman: An intermediate level of expertise (Appendix B)
- Expert: The highest level of expertise (Appendix C)

3.5 Qualification Criteria – Are specified in Appendix A (Novice), Appendix B (Journeyman) and Appendix C (Expert) and include three categories of accomplishments that demonstrate discipline expertise:

- Training – Traditional, online and computer based
- Reference documents – Demonstrating understanding
- On the Job training (OJT) – Demonstrating specific skills

3.6 Prerequisites – Requirements that must be satisfied prior to becoming an Apprentice and participating in the PDRM process are specified in Appendix A.

3.7 Application for Qualification: - Must be submitted by the candidate seeking qualification at the completion of the requirements at each level. Application consists of:

- Completed and approved application Form (Appendix D)
- Completed and approved copy of Appendix A, (for Novice qualification), Appendix B (for Journeyman qualification) or Appendix C (for Expert qualification).

3.8 Implementation requirements – Are specific actions required to initially implement this OI. (See section 4.1).

3.9 Qualification by Designation (Grandfathering) – Is the designation (qualification) by the S&MA Director of an individual at a specific level of discipline expertise without completion of the required PDRM line items. This shall only be allowed during the initial stages of OI implementation to qualify personnel as mentors and champion(s).

3.10 Qualification of Existing Personnel – Shall be earned by candidates who are not eligible for grandfathering by documenting previously completed training. (See section 4.3).

3.11 Equivalent Training Criteria – Are classes or experiences substituted for those specified in the Appendices. During initial stages of the program, or when new employees are transferred into S&MA, previously completed items shall be substituted with approval of the Champion. Thereafter, the Champion must approve all equivalent criteria in advance.

3.12 Personnel and Roles – Required to implement this OI are defined below:

3.12.1 Candidate – Is an employee or mission services contractor who seeks qualification via the professional development roadmap process.

3.12.2 Supervisor – The organizational line manager who provides supervisory functions and responsibilities for employee positions requiring training and/or qualification. The supervisor helps create, and approves, the candidate's IDP, verifies completion of the qualification requirements, and recommends the candidate for qualification.

3.12.3 Mentor – Is a person qualified as a journeyman or expert quality engineer who is selected as, and who agrees to perform as, a coach to the candidate in the PDRM qualification process. Mentors are also responsible for verifying candidate's understanding of the required reference documents. Mentors for candidates seeking expert qualification must be qualified at the expert level.

3.12.4 Quality Engineer Champion – Is an individual recognized as a key leader in the S&MA quality engineering discipline, and is designated by the S&MA Director. The Champion is responsible to the S&MA training manager for technical content of this PDRM, approval of any "equivalent" criteria, selecting and training mentors, and approval of completed PDRM forms submitted for qualification.

3.12.5 Qualification Review Board – Is responsible for reviewing and approving qualification

applications. The Board shall consist of the S&MA Director, the discipline champion, the Safety, Reliability and Quality Assurance Policy & Assessment Department Manager, and others selected by the S&MA Director. The Board shall also review and approve any changes to this OI.

3.13 PDRM Designation Memorandum – A document signed by the Director of S&MA that identifies S&MA personnel who are authorized to serve as discipline champions, mentors and Qualification Review Board members.

3.14 Continuing Development requirement – All personnel qualified, as experts must participate in continued development activity to maintain their qualification.

4. INSTRUCTIONS

4.1 Implementation Requirements – Implementation of this OI shall require the following additional actions:

- Selecting the quality engineering discipline champion, and designating (grandfathering) him/her to be qualified at the expert level.

- Selecting quality engineering discipline mentors, and designating (grandfathering) them to be qualified at the Journeyman or Expert level.

- Appointing Qualification Review Board Members.

- Publishing the PDRM Designation Memorandum.

- Authorizing and initiating a work task for the Champion and/or mentors to prepare a set of checklists and sample questions to be used as guidelines for demonstrating candidate knowledge of the reference documents.

- Formalizing and baselining the in-house courses identified in the Appendices that are currently taught informally by NASA employees and mission services contractors.

- Communicating to all personnel of the existence, purpose, process and names of key personnel associated with this OI.

4.2 Qualification Process
A candidate seeking qualification shall use the following process. This process is further illustrated in the flow chart in Section 11.

4.2.1 Candidate declares S&MA specialty as quality engineer. Supervisor approves.

4.2.2 Candidate documents completion of prerequisites utilizing application form (Appendix D). The application form, along with proof of meeting the prerequisites are then submitted to the supervisor for approval. After approval the candidate is now an Apprentice.

4.2.3 Apprentice seeks/obtains a mentor (with support from the supervisor and discipline champion).

4.2.4 Apprentice works with supervisor to develop an IDP containing appropriate items from the PDRM (Appendix A).

4.2.5 Apprentice pursues the required developmental activities per the PDRM and IDP.

4.2.6 Upon completion of each developmental activity, the Apprentice obtains the proper signature on the roadmap (Appendix A) as shown in the following table:

Criteria Type	**Required Activity**	**Verifying Signature**
Training Classes	Complete successfully	Supervisor
Reference Documents	Demonstrate understanding	Mentor
OJT Experiences	Complete successfully	Supervisor

4.2.7 Upon completion and documentation of all required activities for qualification, Apprentice completes the application form, obtains signatures from the discipline champion and submits completed package to his/her supervisor.

4.2.8 Supervisor signs the application and forwards it to the S&MA Director for action by the Qualification Review Board.

4.2.9 The Qualification Review Board reviews the application, and makes the approval decision.

4.2.10 A Novice earns Journeyman qualification by continuing the above process using Appendix B.

4.2.11 A Journeyman earns Expert qualification by continuing the above process using Appendix C.

4.3 Qualification of Existing Experienced Personnel

Existing S&MA personnel and new personnel transferring into S&MA, who are experienced in the quality engineering discipline, are allowed to seek qualification at any level for which they qualify by documenting their previously completed achievements and using the following

process. This process is further illustrated in the flow chart 11-1.

4.3.1 Candidate documents previously completed training classes and OJT achievements on the appropriate appendices (e.g. a candidate applying for Expert qualification must complete Appendix A, B and C):

- Equivalent training and experiences shall be substituted for the criteria specified in the appendices with the approval of the discipline champion.

- The training organization shall verify training classes. Candidates are responsible for providing proof (e.g. copies of training certificates, grade reports and/or transcripts) of non-NASA training to the training organization.

- OJT shall be verified by signature of the supervisor.

4.3.2 Candidate must demonstrate his/her understanding of the reference documents using the normal qualification process (See section 4.2).

4.3.3. Upon completion and documentation of all required activities for qualification, candidate completes the application form (Appendix D), obtains discipline champion approval and submits the package to his/her supervisor for approval.

4.3.4 Supervisor approves the application and forwards it to the Qualification Review Board for action.

4.3.5. The Qualification Review Board reviews the application and decides the qualification level to be granted.

4.4 Maintaining Qualification – Novice and Journeymen can maintain their qualification by participating in the professional development activity required to achieve the next higher level of qualification.

Experts can maintain their qualification by continued training (at least 40 hours per year) in their discipline and continuing to perform OJT activity at the level described in Appendix C. The forty hours of continued training shall be waived if the Expert obtains and maintains ASQ Certified Quality Engineer Qualification.

4.5 Process Measurement – Measurement shall be accomplished by baselining the number of personnel qualified at each level, and thereafter measuring the progress toward qualification by S&MA employees. The baseline shall be created 6 months after implementation. Measurements shall be made semi-annually thereafter. Each semi-annual measurement shall count the number of individuals qualified at each level, and estimate the progress (percent complete) of each participating individual toward the next level. Organization mangers shall report this

measurement at the next scheduled monthly status review.

4.6 Amendments – Changes to this Organizational Instruction are made per the documented Organizational Instruction Change Process.
The Qualification Review Board shall review proposed changes to this PDRM prior to submitting them to the MSFC Director of S&MA for approval. The custodial responsibility for this PDRM shall be assigned to the Safety, Reliability, and Quality Assurance Policy & Assessment Department.

5. NOTES

5.1. OI Replacement - None

6. SAFETY PRECAUTIONS AND WARNING NOTES

None

7. APPENDICES, DATA, REPORTS, AND FORMS

A – PDRM for Quality Engineer: Novice
B – PDRM for Quality Engineer: Journeyman
C – PDRM for Quality Engineer: Expert
D – Qualification Application Form

8. RECORDS

Record	Repository	Period of Time
Completed PDRM (Official Course completion information shall be kept by the S&MA Training Office)	S&MA Training Officer	5 years (Documentation of the appropriate PDRM shall be kept by the S&MA Training Office.)

9. TOOLS, EQUIPMENT, AND MATERIALS

None

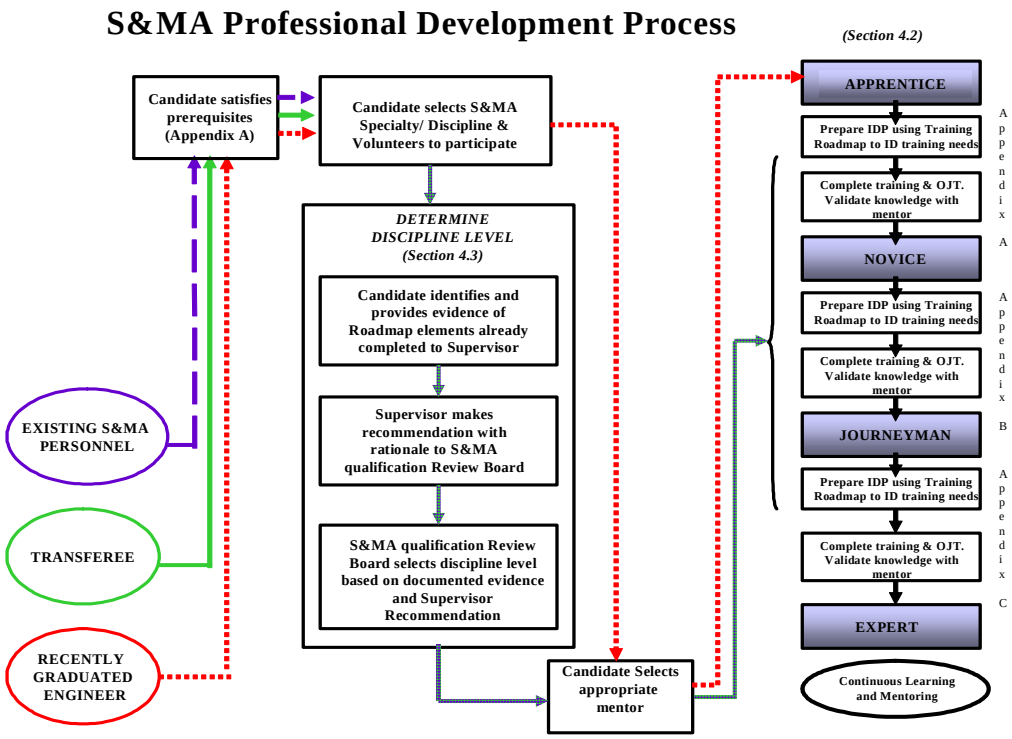
10. PERSONNEL TRAINING REQUIREMENTS

See Appendix A - C

11. FLOW DIAGRAM

The flow diagram (Figure 11-1) illustrates the PDRM qualification process described in this OI.

Figure 11- 1



Note: Qualification Review Board is the decision authority for qualification levels and approvals.

APPENDIX A: PDR for Quality Engineers: NOVICE Qualification Requirements

A.1 Objective:

This Appendix provides the qualification criteria for quality engineers to be qualified at the Novice level, using the process described in the body of the Organizational Instruction.

A.2 Prerequisites:

Prior to beginning the process, the candidate must qualify as an Apprentice quality engineer by satisfying the following prerequisites:

1. Candidate must be an Aerospace Technologist (AST) with an appropriate engineering/scientific degree (chemical, electrical, electronic, industrial, mechanical, system, or equivalent)

2. Candidate must volunteer to participate in the PDRM qualification program, declare his/her specialty as quality engineer, and obtain approval of his/her immediate supervisor.

3. Candidate must complete the S&MA Overview Orientation Class (currently a 4 hour internal class instructed by QD40)

4. Candidate must complete a program specific overview orientation class for the candidate's assigned program, including the S&MA aspects of that program.

5. Candidate must be skilled in the use of the MS Office Suite including Word, Excel and PowerPoint, and must show evidence of capability to make an effective presentation.

A.3 Experience: These engineers are at the beginning stages of their careers and work primarily on small portions of larger projects. Prior to being qualified as a Novice quality engineer, candidate must have at least 1 to 3 years of experience in fields such as quality control, quality inspection contracting and purchasing, supply and storage, industrial or production planning, research and engineering, maintenance and test and evaluation that provides:

1. Familiarity with quality assurance or related work,

2. Pertinent product or process knowledge and skill,

3. Ability to interpret and apply contract requirements and engineering specifications,

4. Skill in dealing with others in person to person work relationships,

5. Rotation in S&MA (inspection) for 3 months.

Notes:

APPENDIX A: PDR for Quality Engineers: NOVICE Qualification Requirements

1. The mentor or discipline champion shall require additional rotation to fulfill any additional experience needed.

2. 1-3 years experience requirement noted in paragraph A-3 above shall be waived by supervisor, if candidate is an ASQ CQE.

APPENDIX A: PDR for Quality Engineers:
NOVICE Qualification Requirements

TRAINING CLASS REQUIREMENTS **Equivalent classes shall be substituted with approval by the Discipline Champion. Sequence is suggested but not mandatory.**		**SIGNATURE/ DATE COMPLETE**
*Basic Quality Training: In-house class (2 hours)		_____ _____ Signature Date
*Second Level Quality Training: In-house class (2 hours)		_____ _____ Signature Date
*Introduction to ISO-9000: In-house class (2 hours)		_____ _____ Signature Date
*Quality Training for New S&MA Employees: MSFC class (hours TBD)		_____ _____ Signature Date
*Analytical Statistical Techniques Basic: MSFC class (TBD hours)		_____ _____ Signature Date
Continuous Risk Management: MSFC Class (TBD hours)		_____ _____ Signature Date
*EEE Parts 101: MSFC class (TBD hours)		_____ _____ Signature Date
*Quality Tailored for MSFC: MSFC class (TBD hours)		_____ _____ Signature Date
Foundations of Project Management: APPL class (3 days)		_____ _____ Signature Date
*System Safety Fundamentals Workshop: MSFC Class (5 days)		_____ _____ Signature Date
*Failure Modes Effects Analysis & Critical Items List: - Solar: SMA-017-01 (1 hour estimated) - MSFC Class (4 hours)		_____ _____ Signature Date

APPENDIX A: PDR for Quality Engineers:
NOVICE Qualification Requirements

Acceptance: Solar - SMA-001-01 (estimated 30 minutes)		_____ _____ Signature Date
Acquisition: Solar - SMA-002-01 (estimated 1 hour)		_____ _____ Signature Date
As Designed vs. As Built: Solar - SMA-003-01 (estimated 30 minutes)		_____ _____ Signature Date
Audits and Reviews: Solar - SMA-004-01 (estimated 1/2 hour)		_____ _____ Signature Date
Configuration Management: Solar - SMA-005-01 (estimated 1 hour)		_____ _____ Signature Date
Data Management: Solar - SMA-012-01 (estimated 1 hour)		_____ _____ Signature Date
Electrical, Electronic and Electromechanical Parts: Solar - SMA-016-01 (estimated 1 hour)		_____ _____ Signature Date
FMEA/CIL: Solar - SMA-017-01 (estimated 1 hour)		_____ _____ Signature Date
Federal Acquisition Regulations: Solar - SMA-018-01 (estimated 1 hour)		_____ _____ Signature Date
*GIDEP Participation and the NASA Advisory: - Solar - SMA-020-01 (estimated 30 minutes - MSFC Class(TBD hours)		_____ _____ Signature Date
Mandatory Inspections: Solar - SMA-030-01 (estimated 30 minutes)		_____ _____ Signature Date
Material Review Board: Solar - SMA-033-01 (estimated 30 minutes)		_____ _____ Signature Date
Metrology and Calibration: Solar - SMA-035-01 (estimated 30 minutes)		_____ _____ Signature Date
NASA Safety Reporting System: Solar - 038-01 (estimated 30 minutes)		_____ _____

APPENDIX A: PDR for Quality Engineers:
NOVICE Qualification Requirements

		Signature Date
Process Control: Solar - 047-01 (Estimated 30 minutes)		_____ _____ Signature Date
Qualification: Solar - SMA-049-01 (estimated 30 minutes)		_____ _____ Signature Date
Receiving Inspection: Solar - SMA-050-03 (estimated 30 minutes)		_____ _____ Signature Date
Reliability and Maintainability Overview: Solar - SMA-051-03 (estimated 15 minutes		_____ _____ Signature Date
Remedies/Corrective Action Strategy: Solar - SMA-052-01 (estimated 30 minutes)		_____ _____ Signature Date
Resident Management Office Activities: Solar - SMA-053-01 (estimated 30 minutes)		_____ _____ Signature Date
Rework and Repair: Solar – SMA-054-01 (estimated 30 minutes)		_____ _____ Signature Date
S&MA Documentation: Solar - SMA-058-01 (estimated 30 minutes)		_____ _____ Signature Date
Software Assurance: Solar - SMA-061-01 (estimated 1 hour)		_____ _____ Signature Date
Stamp Control: Solar - SMA-064-01 (estimated 30 minutes)		_____ _____ Signature Date
Suppliers Quality Program Plan: Solar - SMA-065-01 (estimated 30 minutes)		_____ _____ Signature Date
Testing: Solar - SMA-067-01 (estimated 1 hour)		_____ _____ Signature Date
Training and Qualification - Solar - SMA-068-01 (estimate 30 minutes)		_____ _____ Signature Date
Interpersonal/communication Skills on technical teams; class to be identified.		_____ _____ Signature Date
NASA ISO 9000 Auditor Class: NASA HQ sponsored class (3 days)		_____ _____

APPENDIX A: PDR for Quality Engineers:
NOVICE Qualification Requirements

		Signature Date
Systems Management: NET Class (3.5 days) plus: - Pre-class session at MSFC to discuss relevant questions regarding QE role in systems engineering (led by champion) (2 hours) - Post class student feedback to the S&MA QUALITY team (2 to 4 hours) (OPTIONAL)		_____ _____ Signature Date
Class in Technical Writing: Class to be identified		_____ _____ Signature Date
Microsoft Project-Introduction: MSFC Professional Development Class (2.5 days) OR MSFC video class, Building 4200 (Number TBD): (OPTIONAL)		_____ _____ Signature Date
Influencing Others: MSFC Organizational Development Class (1 day) (OPTIONAL)		_____ _____ Signature Date
Conflict Management: MSFC Professional Development Class (2 days) (OPTIONAL)		_____ _____ Signature Date

Note:
Classes identified by an asterisk are not yet formally registered with the training organization, but shall be in the near future.

APPENDIX A: PDR for Quality Engineers:
NOVICE Qualification Requirements

REFERENCE MATERIALS **Demonstrate familiarity with key concepts as defined by the Discipline Champion**		**SIGNATURE/ DATE COMPLETE**
ANSI/ISO/ASQ Q9001-2000, "American National Standard, Quality management systems – Requirements"		_____ _____ Signature date
AS-9100 "Quality Systems – Aerospace – Model for Quality Assurance in Design, Development, Production, Installation and Servicing"		_____ _____ Signature date
NSTS 5300.4 (1D-2) Safety, Reliability, Maintainability and Quality Provisions for the Space Shuttle Program		_____ _____ Signature date
NHB 5300.4(1C) Inspection Systems Provisions for Aeronautical and Space System Material, Parts, Components, and Services" Cancelled (Shuttle)		_____ _____ Signature date
MPD 1280.1 Marshall Management System		_____ _____ Signature date
SSP-41173 ISS Quality System Requirements		_____ _____ Signature date
SSP-50431 ISS Program Requirements-Payloads		_____ _____ Signature date
NPD 1280.1, "NASA Management System Policy"		_____ _____ Signature date

Note:
The Process Champion is responsible for identifying specific level of understanding required (See section 4.1).

APPENDIX A: PDR for Quality Engineers:
NOVICE Qualification Requirements

ON THE JOB TRAINING **Complete the following activities or equivalent. (see Note)**		SUPERVISOR SIGNATURE/ DATE COMPLETE
Under appropriate supervision, observe/support conduct of system drawing review and/or inspection in support of a NASA project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support conduct of a requirements review in support of a NASA project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support review of contract statement of work (quality section) in support of a NASA project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support conduct of internal audit in support of a NASA project or program.		_____ _____ Signature date
Under appropriate supervision, observe/support conduct of external audit in support of a NASA project or program.		_____ _____ Signature date
Observe/support a Pre-flight Assessment review in support of a NASA project or program		_____ _____ Signature date
Observe/support a Flight Readiness Review in support of a NASA project or program		_____ _____ Signature date
Observe a team creating a fault tree in support of a NASA project or program		_____ _____ Signature date
Observe/support at least one design review in support of a NASA project or program		_____ _____ Signature date
Participation in relevant professional society. Example: American Society for Quality. (OPTIONAL)		_____ _____ Signature date

APPENDIX A: PDR for Quality Engineers:
NOVICE Qualification Requirements

Perform 3 months OJT with the ED32 NDE Team or equivalent. (optional)		_____ _____ Signature Date
Perform 3 months OJT at a manufacturing facility, e.g. Lockheed, Boeing, Thiokol, etc. (optional)		_____ _____ Signature Date
Perform 3 months OJT at a space equipment test or launch facility. (optional)		_____ _____ Signature Date

Note:
The candidate shall work with his/her supervisor to identify specific applicable assignments. The Discipline Champion shall be consulted to ensure proposed assignment shall satisfy the qualification requirements.

APPENDIX B: PDR for Quality Engineers: JOURNEYMAN Qualification Requirements

B.1 Objective:

This Appendix provides the qualification criteria for quality engineers to be qualified at the Journeyman level, using the process described in the body of the Organizational Instruction.

B.2 Prerequisites:

Prior to beginning the process, the candidate must be qualified as a Novice quality engineer per the requirements in Appendix A.

B.3 Years of Experience:

Prior to qualification as a Journeyman quality engineer, candidate shall have 3 to 5 years of relevant experience in the discipline that demonstrates:

1. Practical knowledge in monitoring, controlling, or maintaining the quality of products or services in quality assurance, procurement, inspection, production or related areas,

2. Direct experience in Hardware, Electrical Systems, or Software with a solid base of technical expertise and

3. Working independently and managing definite portions of projects.

APPENDIX B: PDR for Quality Engineers:
JOURNEYMAN Qualification Requirements

TRAINING CLASS REQUIREMENTS **Equivalent classes shall be substituted with approval by the Discipline Champion. Sequence is suggested but not mandatory**		**SIGNATURE/ DATE COMPLETE**
Systems Requirements: NET Class (4 days) (OPTIONAL)		_____ _____ Signature date
Inspection Planning: Solar - SMA-026-01 (estimated 30 minutes)		_____ _____ Signature date
Manufacturing Process Control: Solar - SMA-031-01 (estimated 30 minutes)		_____ _____ Signature date
Mission Assurance Planning: Solar - SMA-037-01 (estimated 1 hour)		_____ _____ Signature date
Project Surveillance Plan: Solar - SMA-048-01 (OPTIONAL)		_____ _____ Signature date
R&M and the Formulation Subprocess: Solar - SMA-081-03 (OPTIONAL)		_____ _____ Signature date
R&M and the Approval Subprocess: Solar - SMA-082-03 (OPTIONAL)		_____ _____ Signature date
Statistical Methods for Engineers: ISE 690 at UAH (OPTIONAL)		_____ _____ Signature date
Design For Reliability & Maintainability: DFR-101 & 201: In-house class (4 hours) (OPTIONAL)		_____ _____ Signature date
Statistical Quality Control (SQC): ISE 523 at UAH (OPTIONAL)		_____ _____ Signature date
NASA ISO 9000 Lead Auditor Class: NASA HQ sponsored class (5 days) (OPTIONAL)		_____ _____ Signature date
Cost of Quality: Solar - SMA-010-01 (estimated 5 minutes) (OPTIONAL)		_____ _____ Signature date
R&M and the Implementation Subprocess: Solar - SMA-083-03 (OPTIONAL)		_____ _____ Signature date
R&M and the Evaluation Subprocess: Solar - SMA-084-03 (OPTIONAL)		_____ _____ Signature date

APPENDIX B: PDR for Quality Engineers:
JOURNEYMAN Qualification Requirements

Leading from the Inside Out: MSFC Professional Development Class (2 days) (OPTIONAL)		_____ _____ Signature date
Communicating For Results: MSFC Professional Development Class (2 days)(OPTIONAL)		_____ _____ Signature date
Team Development in the Workplace: MSFC Organizational Development Class (3 days)(OPTIONAL)		_____ _____ Signature date
Mentoring: MSFC Organizational Development Class (1 day). Suggested at end of qualification for Journeyman (OPTIONAL)		_____ _____ Signature date

Note:

1. UAH = University of Alabama at Huntsville. Up to 12 credits shall be earned without registering for degree. The recommended UAH class sequenceis shown in the table above.

APPENDIX B: PDR for Quality Engineers:
JOURNEYMAN Qualification Requirements

REFERENCE MATERIALS **Demonstrate working knowledge with contents as defined by the Discipline Champion**		**MENTOR SIGNATURE/ DATE COMPLETE**
NSTS 07700 Program Definition and Requirements Documents – Volume 10; Specific sections to be identified by Champion.(Shuttle)		_____ _____ Signature date
Project Management Documents (7120 series)		
NPG 8000.4: Risk Management Procedures and Guidelines.		_____ _____ Signature date
MSFC-HDBK-3173: Project Management and Systems Engineering Handbook (pages to be identified by Champion)		_____ _____ Signature date
SP-6105: NASA Systems Engineering Handbook (pages to be identified by Champion)		_____ _____ Signature date
NASA Reference Publication 1358: Systems Engineering "Toolbox" for Design-Oriented Engineers (pages to be defined by Champion)		_____ _____ Signature date
Systems Engineering Tools Survey for R&M, SS and Quality: Link to RAC: http://rac.alionscience.com/rac/jsp/softtools/softtool.jsp (OPTIONAL)		_____ _____ Signature date

Note:
Discipline Champion is responsible for identifying specific level of understanding required (See section 4.1).

APPENDIX B: PDR for Quality Engineers:
JOURNEYMAN Qualification Requirements

ON THE JOB TRAINING **Complete the following activities or equivalent. (see Note)**		**SUPERVISOR SIGNATURE/ DATE COMPLETE**
Conduct (or participate on a team conducting) system drawing review and/or inspection in support of a NASA project or program.		_____ _____ Signature date
Conduct (or participate on a team conducting) requirements review in support of a NASA project or program.		_____ _____ Signature date
Review (or participate on a team reviewing) a contract statement of work (quality section) in support of a NASA project or program.		_____ _____ Signature date
Perform (or participate on a team performing) an internal audit in support of a NASA project or program.		_____ _____ Signature date
Perform (or participate on a team performing) an external audit in support of a NASA project or program.		_____ _____ Signature date
Perform (or participate on a team performing) a pre-flight Assessment review in support of a NASA project or program		_____ _____ Signature date
Perform (or participate on a team performing) a Flight Readiness Review in support of a NASA project or program		_____ _____ Signature date
Participate in a Failure Investigation to determine cause and corrective action in support of a NASA project or program		_____ _____ Signature date
Participate in a Material Review Board in support of a NASA project or program		_____ _____ Signature date
Perform (or participate on a team performing) at least two different types of design reviews in support of a NASA project or program.		_____ _____ Signature date

APPENDIX B: PDR for Quality Engineers:
JOURNEYMAN Qualification Requirements

Participation in relevant professional society. Example: American Society for Quality. (OPTIONAL)		_____ _____ Signature date
Participate in inter-program or inter-center coordinating activity to enhance MSDC and/or NASA expertise in your discipline (OPTIONAL)		_____ _____ Signature date
Work toward professional qualification (OPTIONAL)		_____ _____ Signature date
Mentor other personnel in your discipline to help them improve their skills and expertise. This can be as a mentor to others in this PDRM process or as an informal coach in your daily work.		_____ _____ Signature date

Note:
The candidate shall work with his/her supervisor to identify specific applicable assignments. The Discipline Champion shall be consulted to ensure proposed assignment shall satisfy the qualification requirements.

APPENDIX C: PDR for Quality Engineers: EXPERT Qualification Requirements

C.1 Objective:

This Appendix provides the qualification criteria for quality engineers to be qualified at the Expert level, using the process described in the body of the Organizational Instruction.

C.2 Prerequisites:

Prior to beginning the process, the candidate must be qualified as a Journeyman quality engineer per the requirements of Appendix B.

C.3 Years of Experience:

Prior to being qualified as an Expert quality engineer, the candidate must have at least 8 to 10 years experience in the quality profession with:

1. Unique experience in NASA hardware projects and programs,

2. Responsibility for developing Novice and Journeyman quality engineers, and

3. Serving as leaders or promoters of large portions of a project or an entire project.

APPENDIX C: PDR for Quality Engineers:
EXPERT Qualification Requirements

TRAINING CLASS REQUIREMENTS **Equivalent classes shall be substituted with approval by the Discipline Champion. Sequence is suggested but not mandatory**		**SIGNATURE/ DATE COMPLETE**
Comprehensive Systems Skills: NET Class (5 days)		_____ _____ Signature date
R&M and the Implementation Process: Solar – SMA-083-03		_____ _____ Signature date
R&M and the Evaluation Process: Solar – SMA-084-03		
Crossing Department Lines: NASA HQ Class, Agency leadership and Development programs (5 days). (OPTIONAL)		_____ _____ Signature date
Elective: To be determined by discipline champion		_____ _____ Signature date
Elective: To be determined by discipline champion		_____ _____ Signature date
Problem Solving and Decision Making: MSFC Organizational Development Class (3 days) (OPTIONAL)		_____ _____ Signature date
Leadership/Teamwork Class Elective: To be selected by candidate (OPTIONAL)		_____ _____ Signature date

APPENDIX C: PDR for Quality Engineers:
EXPERT Qualification Requirements

REFERENCE MATERIALS **Demonstrate comprehensive knowledge of contents as defined by the Discipline Champion**		**MENTOR SIGNATURE/ DATE COMPLETE**
MSFC-HDBK-3173: Project Management and Systems Engineering Handbook (pages to be identified by Champion)		_____ _____ Signature date
SP-6105: NASA Systems Engineering Handbook (pages to be identified by Champion)		_____ _____ Signature date
NSTS 22206 Guidelines for Failure Modes Effects and Critical Items List		_____ _____ Signature date
NASA Reference Publication 1358: System Engineering Toolbox for Design Oriented Engineers (Pages to be identified by Champion)		_____ _____ Signature date

APPENDIX C: PDR for Quality Engineers:
EXPERT Qualification Requirements

ON THE JOB TRAINING **Complete the following activities or equivalent. (see Note)**		**SUPERVISOR SIGNATURE/ DATE COMPLETE**
Lead a team creating Quality "Checklists" in support of a NASA project or program.		_____ _____ Signature date
Lead a team conducting a system drawing review and/or inspection in support of a NASA project or program.		_____ _____ Signature date
Lead a team conducting requirements review in support of a NASA project or program.		_____ _____ Signature date
Lead a team reviewing a contract statement of work (quality section) in support of a NASA project or program.		_____ _____ Signature date
Lead a team performing an internal audit in support of a NASA project or program.		_____ _____ Signature date
Lead a team performing an external audit in support of a NASA project or program.		_____ _____ Signature date
Lead a team performing a pre-flight Assessment review in support of a NASA project or program		_____ _____ Signature date
Serve as S&MA Representative on a Flight Readiness Review in support of a NASA project or program		_____ _____ Signature date
Perform as the quality representative in a Failure Investigation to determine cause and corrective action in support of a NASA project or program		_____ _____ Signature date
Serve as S&MA Representative on a Material Review Board in support of a NASA project or program		_____ _____ Signature date

APPENDIX C: PDR for Quality Engineers:
EXPERT Qualification Requirements

Participate in inter-program or inter-center coordinating activity to enhance MSFC and/or NASA expertise in your discipline		_____ _____ Signature date
Become a mentor for others in Quality. Guide other team members, including design team members, to understand the importance and benefits of upfront Quality efforts, to influence the design and to provide high value contribution to the program.		_____ _____ Signature date
Participate in activity to establish guidelines and processes for a stronger quality engineering discipline at NASA.		_____ _____ Signature date
Conduct, lead or contribute significantly to benchmarking studies within NASA, DOD and other Industries to achieve superior S&MA quality processes.		_____ _____ Signature date
Lead or proactively participate in design reviews, and support program and project reviews		_____ _____ Signature date
Participation in relevant professional society. Example: American Society for of Quality. (OPTIONAL)		_____ _____ Signature date

Note:
The candidate shall work with his/her supervisor to identify specific applicable assignments. The Discipline Champion shall be consulted to ensure proposed assignment shall satisfy the qualification requirements.

APPENDIX D: PDR for Quality Engineers:
Application for Qualification

This application is for (Check One):

___ Entry into the PDRM Qualification process as an Apprentice;
All prerequisites have been satisfied

___ NOVICE Qualification
Appendix A is Attached and approved

___ JOURNEYMAN Qualification
Appendix B is attached and approved

___ EXPERT Qualification
Appendix C is attached and approved

Name of Candidate: _____

Organization: _____

Building/Location: _____

Phone: _____ Email: _____

Signatures:

Candidate Signature: _____ Date: _____

Discipline Champion: _____ Date: _____

Supervisor Signature: _____ Date: _____

S&MA Director: _____ Date: _____